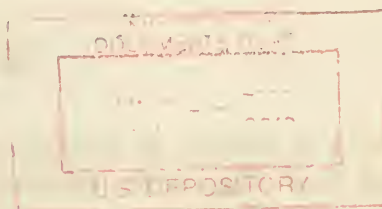


113.27/14 1407

**THE GRINDING OF ENGELMANN SPRUCE FOR NEWSPRINT AND
MAGAZINE QUALITY MECHANICAL PULPS**

January 1942



**UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
FOREST PRODUCTS LABORATORY
Madison, Wisconsin**

In Cooperation with the University of Wisconsin

THE GRINDING OF ENGELMANN SPRUCE FOR NEWSPRINT
AND MAGAZINE QUALITY MECHANICAL PULPS

By

E. R. SCHAFER, Engineer
and
J. C. PEW, Associate Engineer

Introduction

Interest in the development of a pulping industry in the Rocky Mountain region with Engelmann spruce as the principal pulpwood as well as the increasing use of this species by Lake States pulp mills has prompted the Forest Products Laboratory, in cooperation with the Northern Rocky Mountain Forest and Range Experiment Station, to verify and extend former work¹ on the sulfite, sulfate, and groundwood processes. This report describes the comparative grinding characteristics of Engelmann spruce and white spruce for newsprint and magazine quality pulps.

Procedure

Bolts 6 inches in length were cut from the 32 logs of the sample cord selected from Engelmann spruce, shipment 1509 (L-1561).² The bolts were divided into two lots, each being a representative mixture of the wood in the three trees comprising the cord. This wood was substantially in the green state when ground. The white spruce used for comparison was obtained by cutting six partially seasoned 8-foot logs from shipment 1571 into 6-inch bolts and dividing into three lots, each of which was representative of the six logs taken. Two of the lots were used in this study.

¹"The Suitability of American Woods for Paper Pulp." U. S. Dept. Agric. Bul. 1485 (1927).

"Groundwood Pulp." U. S. Dept. Agric. Bul. 343 (1916).

²"Physical and Chemical Properties of Engelmann Spruce Pulpwood, Shipment 1509," by J. C. Pew and E. R. Schafer. Problem D-192, project L-168-7, filed October 8, 1941.

The comparison of the grinding properties of the two species of wood was made with two conditions of grinder stone surface. The 3760/5, grade N7 Norton stone had previously been burred with an 8-cut, 1-1/2-inch lead spiral burr and a 14-point diamond burr, and had been in service until the stone surface was decidedly dull. The first pair of experiments was made on this surface. Pressure was adjusted so as to give somewhat above normal energy consumption. In the second set of experiments the stone was dressed with a 10-cut, 1-1/2-inch lead spiral burr and then a 14-point diamond burr, and waste wood ground until the surface was in a stable condition but still quite sharp. The pressure in this case was adjusted so as to give normal or somewhat below normal energy consumption. Pit temperature, stone immersion, and consistency were kept substantially constant in each pair of experiments. The pulps obtained were lapped on the wet machine and samples tested according to standard methods.²

Results

The properties of the wood ground, the grinding conditions and pulp test results are given in table 1. The two species of spruce had about the same density but the white spruce was considerably drier. Because of the difference in diameter it was not possible to charge the pockets in exactly the same manner with both species so the actual pressures may have been somewhat at variance. The runs on the dull stone surface (grinder runs 393 and 394) utilized somewhat above the normal amount of energy but gave exceptionally strong pulps, with slightly lower than normal freeness and average fiber length. With a sharp stone (grinder runs 395 and 396) free pulps of standard strength were produced at rather low energy consumption. The two species gave pulps of about equal strength-energy ratios, with both the dull and sharp stone surfaces; therefore, it is concluded that Engelmann spruce and white spruce of about the same density will grind similarly and produce similar pulps.

The properties of the two pulps produced at the lower energy consumption were so close to that of standard newsprint groundwood that experiments on the making of newsprint paper from them did not seem to be necessary. The pulps produced at the higher energy consumption were of sufficiently high quality to consider them suitable for use in groundwood-containing book and magazine papers although no experiments were made to prove this. These two pulps were also interesting from the standpoint of making a newsprint paper entirely from groundwood. Table 2 shows the results of paper machine runs with 100 percent of the Engelmann and white spruce groundwoods and the average of commercial newsprints for comparison. The experimental papers compare quite well with the commercial. The bursting and tensile strengths are higher than the average standard newsprint but the tearing strengths are lower. The castor oil penetrations of the experimental papers are appreciably higher than the standard, indicating there would be less rapidity in absorbing the printing ink. From the standpoint of machine operation the principal difference as compared to a standard furnish is the necessity of running the machine slower because of the lower freeness of the groundwood pulps.

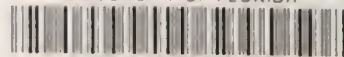
²Manual of standard testing methods for pulpwood, pulp, stuff, and paper, Forest Products Laboratory.

Table 2.--Newsprint paper composed entirely of Engelmann and white spruce groundwood pulps

Machine:	Groundwood pulp																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
----------	-----------------	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

¹Standard ream 25 x 40 -- 500. To convert to the newsprint trade ream of 24 x 36 -- 500 multiply by 0.864

UNIVERSITY OF FLORIDA



3 1262 08925 4824